UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Home Economics
Washington, D. C.

Home Economics Bibliography 8

TEXTILES AND CLOTHING

SELECTED LIST OF REFERENCES ON THE PHYSICAL TESTING OF FABRICS

Margaret B. Hays, Asst. Textile Physicist
Division of Textiles and Clothing.

January, 1932.

A Selected List of References on the Physical Testing of Fabrics.

TABLE OF CONTENTS

FOREWORD.

This bibliography contains English, French, German, and a few Dutch books and articles on the physical testing of fabrics. Only those references to methods of testing, descriptions of instruments or studies of methods have been included. Although the continental literature has not been searched exhaustively, an effort has been made to have this complete back to 1920, some citations of an earlier date being included.

The references are arranged by subjects, which are in turn classified chronologically according to authors. Citations are made in accordance with the procedure used in the Journal of Agricultural Research. Abbreviations of titles of periodicals are those employed in the Experiment Station Record and are listed in U. S. Department of Agriculture Dept. Bul. 1330.

Acknowledgment is made to Jeanne D. Guerin for assistance in compiling these references.

GENERAL

(1) Anonymous
1918. Testing and properties of textile materials. U. S. Dept. Com., Bur. Standards Circ. 41, 15 p., illus.
Outlines the procedure to be used for determining weight, tensile strength and elongation, fiber composition, thread count, yarn number, folding endurance, and color fastness of fabrics.

(2) ________
1921. Vorschriften für offentliche Warenprüfungsamt für das Textil-Gewerbe, [Directions for public textile tests for the textile industry.] Chemnitz 68 p. (Abstract in Jour. Textile Inst. 17: A378, 1926.)
Methods of conditioning, of measuring count, twist, tensile strength and elongation of yarns, and determining length, weight, and strength of fabrics, as well as some chemical tests, are described for cotton, artificial silk, wool, and linen.

(3) ________
1925. Directions for the study of unvarnished textile fabrics. Jour. Inst. Elect. Engin. 63:133-146, illus. (Report from Brit. Elect. & Allied Indus. Research Assoc.)
Directions are given for determining yarn count, twist, breaking strength of yarn and fabric, thread count, thickness, tearing and bursting strength and aging.

(4) ________
1928. Verslagen en medeelingen van de afdeeling handel en nijverheid van het department van arbeid, handel en nijverheid. [Reports and contributions of the section of Commerce and Industry, Dept. of Labor, Commerce, and Industry.] Jaargang No. 3. (1). 53 p., illus. (Abstract in Jour. Textile Inst. 20:A405-A407. 1929)
Describes methods and instruments for textile testing.

(5) ________
1929. General specifications for textile materials. (Methods of physical and chemical tests.) U. S. Dept. Com., Bureau Standards U. S. Govt. Master specification No. 345a. 6 p.
General test methods are described.

(6) ________
1930. A handbook of hosiery testing. 51 p. New York, U. S. Testing Co.
Outlines the methods for analyzing hosiery.

(7) Barker, A. F., and Midgley, E.
1922. Analysis of woven fabrics. 2nd ed., 322 p., illus. London, Scott, Greenwood & Son.
Methods of analysis are given. Chapters on the dyeing and finishing of cloths are also included.

(8) Chittick, J.
1921-1922. Counting threads in fabrics. Textile World 60: [3623], [3625]; 61: 331, 380.
Various types of counting glasses are described and directions are given for counting the threads in fulled, napped, pile and sateen striped fabrics.

(9) Griffin, R. C.
1927. Technical methods of analysis. 936 p., illus. New York, McGraw-Hill.
Methods for testing fabrics and yarns are described.

(10) Hartley, H.
1926. Fabric analysis - the contraction of warp and weft. Jour. Textile Inst. 17: T254-T258, illus.
Reports method of determining crimp.

(11) Haven, G. B.
1930. Future textile laboratory practice. Amer. Dyestuff Rptr. 19(21): [757] -761, 782-785, illus.
A brief outline is given of tests for determining yarn balance, corkscrew and crimp of yarns, rate and amount of water absorption, yarn slippage, bursting strength, thickness, abrasion, heat flow, and resilience. Includes novel method of preparing the strips for the yarn slippage test.

(12) Heerman, P., and Herzog, A.
1931. Mikroskopische und Mechanisch-Technisch Textiluntersuchungen. [Microscopic and mechanical-technical textile investigations.] 3rd ed., 451 p., illus. Berlin, Julius Springer.
Methods and apparatus for textile testing are given. There are sections on determining abrasion, air permeability, bursting strength, tensile strength, waterproofness and yarn count.

(13) Herzfeld, J.
1902. The technical testing of yarns and textile fabrics. Trans. by C. Salter from the German. 207 p., illus. London, Scott, Greenwood & Son.
Methods for making tests and descriptions of apparatus are included.

(14) Kurokawa, K.
1923. Acoustic constants of cloth. Jour. Inst. Elect. Japan. 415:113-141. (Abstract in Sci. Abs. Sect. A 26:974. 1923.) [Original not seen.]
Describes a new method called "surge impedance density" for measuring the acoustic constants of cloth.

(15) Matthews, J. M.
1924. Textile fibers. 4th ed. 1053 p., illus. New York, John Wiley and Sons.
This book contains 3 chapters on fabric analysis and fabric testing.

(16) Mercier, A. A.
1930. Coefficient of friction of fabrics. U. S. Dept. Com., Bur. Standards, Jour. Research 5(2):243-246, illus.
Reports simple method for specifying the slipperiness of fabrics.

(17) Morton, W. E., and Turner, A. J.
1928. Influence of the degree of twist in yarns on the results of yarn mercerization, and on the properties of plain fabrics made from grey or mercerized cotton yarns. Part II. The results of various strength tests on fabrics. Jour. Textile Inst. 19: T189-T222, illus.
A new machine for wear-testing is described. Impact tests and rip strength tests were studied.

(18) Myers, W.
1914. Effect of structure on the strength and wearing qualities of cloth. Textile World Rec. 48:89-96, illus.
The author proposes cutting strips for breaking strength on a 45° diagonal. A cylinder rubbing machine is also described for use in determining the wear resistance of fabrics.

(19) Posselt, E. A.
[n.d.] Fabric Analysis. 231 p., illus. Philadelphia, Textile Publishing Co.
Methods and instruments for testing fabrics are given.

(20) Strauss, W.
[n.d.] Clothing: Testing. Alberhalden's Handbuch Biol. Arbeitsmethoden Abt. IV. teil 11:87-178. (Abstract in Jour. Textile Inst. 20:A509. 1929.)
Outlines general microscopical, chemical and physical methods of testing textiles.

(21) Turner, A. J.
1931. Random and systematic selections of warp specimens in cloth sampling. Jour. Textile Inst. 22(2): T77-T97, illus.
The results obtained by the random and systematic methods of sampling are compared. Results are not vitiated by using the systematic method but in general the author advocates random selection.

AIR PERMEABILITY

(22) Anonymous
1930. An improved densometer for textiles. Textile World 78(3): 321.
The densometer is an instrument for determining the time required for a known amount of air to pass, under approximately constant pressure, through a known area of the material under test.

(23) Edwards, R. S.
1930. Air permeability of leather. Jour. Int. Soc. Leather Trades' Chemists 14(9): 392-409, illus. (Abstract in Jour. Tech. Assoc. Fur Indus. 1(4):170. 1930.)
Two experimental methods of determining air permeability of leather are described. One of the methods does not require the skin to be cut up.

(24) Herzog, G.
1912. Ueber die Prüfung der Luftdurchlässigkeit von Geweben. [Concerning the testing of the air permeability of fabrics.] Mitt. K Materialprüfungsamt zu Grosslichterfelde West [Berlin] 30:309-319, illus.
Discusses the experimental method and apparatus for determining air permeability. Both wet and dry fabrics were studied.

(25) Marsh, M. C.
1931. Some notes on the permeability of fabrics to air. Jour. Textile Inst. 22(1): T56-T63, illus.
A description of the apparatus is given. Linen, duck, and knitted artificial silk are some of the fabrics studied.

(26) Sale, P. D. and Hedrick, A. F.
See citation (107).

(27) Shiefer, H. F., and Best, A. S.
1931. A portable instrument for measuring air permeability of fabrics. U. S. Dept. Com., Bur. Standards, Jour. Research. 6(1): 51-58, illus.
A description is given of the apparatus developed at the Bureau of Standards to measure air permeability. The pressure drop across the fabric and across the orifice meter were measured to determine the volume of air passing through the fabric.

(28) Schmidt, P.
1909. Zur Bestimmung der Luftdurchlässigkeit von Kleidungsstoffen. [On the determination of air permeability of clothing material.] Arch. Hyg. 70: [8] -16, illus.
Describes an apparatus for determining air permeability. In regard to air transfer, the fabric acts like a system of capillaries. The volume of air passing through is directly proportional to the pressure and indirectly to the resistance.

COLOR FASTNESS

(29) Appel, W. D.
1925. A new lamp for fading tests. Amer. Dyestuff Rptr. 14: 882-885.
A 1,000 Watt gas filled Mazda lamp is surrounded by copper sulphate solution to remove the heat. The samples are mounted on a rotating disc while being exposed to the light of the lamp.

(30) Appel, W. D., Smith, W. C., and Christison, H.
1928. Machine for laboratory washing tests. Amer. Dyestuff Rptr. 17:679-683, illus. (Abstract in Chem. Abs. 23: 284. 1929.)
The proposed specifications for a washing machine to be used for fastness tests and the proposed general specifications for a standard laboratory washing procedure are outlined.

(31) Appel, W. D.
1928. Method for measuring the color of textiles. Amer. Dyestuff Rptr. 17:49-54, illus. (Abstract in Jour. Textile Inst. 19:A138. 1928.)
A description is given of the partial spectrophotometric method of measuring color.

(32) Cunliffe, P. W.
1929. The measurement of the colour of textile fabrics and some applications to problems of fading. Jour. Soc. Dyers and Colourists 45(11): [305]-321.
Discusses the methods and the instruments used to measure color.

(33) Cunliffe, P. W.
1931. Standardising the methods of testing the fastness of dyed materials. Textile Manfr. 57(675):110-111.
The author concludes that the fadeometer is moderately successful for silk and wool, while the fugitometer is a little better, but neither is completely successful in reproducing the effect of sunlight. He reports that a new lamp with a humidifying arrangement is being built to test fastness to light. In washing tests for color fastness he uses thermos bottles for temperatures up to 70° C.

(34) Hochbein, E., and Knebel, E.
1925. Belichtungsversuche mit der Osram-Punktlichtlampe. [Fading investigations with the Osram-point lamp] Melliand's Textilber. 6:912-914, illus.
The lamp described emits light of the same spectral composition as sunlight.

(35) Mees, C. E. K.
1930. Color and its measurement. Proc. Amer. Soc. Testing Materials 30 (Part II):9-25, illus.
Describes and discusses various types of colorimeters useful in determining color fading.

(36) Parker, R. G., and Jackman, D. N.
1928. The fastness of dyed fabrics to laundering. Jour. Textile Inst. 19:T223-T232.
German and American test methods are compared.

(37) Trotman, S. R.
1927. The testing of dyestuffs for fastness to washing. Jour. Soc. Dyers and Colourists 43:192.
A method is described which does not rely on visual tests alone.

(38) Vass, C. C. N., and McSwing, B. A.
1930. Fastness of dyes to perspiration; the composition of human perspiration. Jour. Soc. Dyers and Colourists 46:190-195.
A study of the composition of human perspiration is reported.

DURABILITY

(39) Anonymous
1918. Measuring wearing value of cloth. Textile World Jour. 54:943, 945, illus.
A description is given of an apparatus developed to test the wear on the seat of trousers. A cane chair seat was used as the abradant.

(40) ________
1925. Abrasion testing machine. Textile World 68:915, illus.
This machine was designed for testing hosiery. The stocking is placed on a form and the toe and heel rubbed against duck held under tension. If the hose withstands this treatment a definite length of time it is considered satisfactory.

(41) ________
1926. Abrasion tester. Textile World 69: 2885, illus.
In this apparatus, the abrasion is produced by pulling a test strip of fabric, held under tension, to and fro through a steel comb.

(42) ________
1930. Machine determines wearing qualities of textile fabrics. Textile World 78(4):55.
The U. S. Testing Laboratories have developed a reciprocating type machine for testing abrasion. The loss in tensile strength after abrading is taken as a measure of the wear.

(43) ________
1930. Aus der Praxis des Arbeitens am Ernst Müllerschen Scheuerapparat. [On the use of Ernst Muller's abrasion apparatus.] Leipziger Monatsschr. Textil Indus. 45:419-420;455-457, illus. (Abstract in Jour. Textile Inst. 22:A263. 1931.)
Description of an abrasion machine designed by Ernst Müller and a modification that permits a view of the fabric, without stopping the machine.

(44) ________
1931. Wear testing machine for carpets. Textile World 79(3): 260-261.
Notes a machine, developed by the Mohawk Carpet Mills, that has an abrasive surface which tends to pull out the pile of the carpet.

(45) Ashcroft, A. G.
1931. Scientific control requisite in testing wearing qualities of woven floor covering. Textile World 80(11): 957, illus.
A description and critical discussion of the machine developed by the Mohawk Carpet Mills are given. See citation (44).

(46) Brackett, W. R., Floyd, E. V., and Dennen, A. C.
1928. New abrasion machine controls temperature, humidity, pressure, tension, and rate of rubbing. Textile World 74: 3019-3020, illus.
Describes a machine designed at Kansas State Agricultural College. Serge was used as the abradant.

(47) Brassell, A. L.
1931. Wear tests on carpets. Melliand 2(10):1358-1360, illus.
The machine designed by the U. S. Testing Co. to test the wear on carpets simulates the scuffing action of the foot in walking.

(48) Crawshaw, H., Morton, W. E., and Brown, K. C.
1931. Experiments in fabric wear testing. Jour. Textile Inst. 22(1):T64-T76, illus.
Carborundum abrasive is used on the machine described. The loss in strength of the samples determined after a definite number of rubs. The authors conclude that the tension of the fabric during abrasion has no significant influence on the strength loss.

(49) Edwards, W. F.
1926. Wearing tests on textile fabrics. Textile World 69: 3817, 3819, illus.
Discussion of abrasion tests that are suitable for the comparison of fabrics.

(50) Ethridge, R. P.
1924. A machine for investigating the resistance of fabrics to abrasion. Testing 1(2):156-159, illus.
The apparatus described uses a hollow drum with bronze blades as the abradant. The drum reverses after each revolution.

(51) Hausman, L. A.
1921. Durability of furs and fabrics. Sci. Amer. 4:252-254, illus. (Abstract in Jour. Textile Inst. 12:491.)
The attritiometer, an apparatus for determining the durability of fur, is briefly described.

(52) Haven, G. B.
1929. New abrasion machine. Textile World 76(18):2654-2656, 2662, illus.
On this machine emery cloth is used with different size rollers, the size being dependent on the weight of the cloth to be tested.

(53) Kapff, S.
1923. Ueber den Einfluss chemischer und physikalischer Einwirkungen auf die Wolle und die Prüfung der Tuche auf ihre Tragfähigkeit. [On the chemical and physical treatment of wool and the testing of the durability of fabrics.] Melliand's Textilber. 4(4):181-188, illus.
Several machines for abrasion are described. Includes one, using the test material as abradant, which, according to the author, duplicates the wear a cloth would receive in actual use.

(54) Myers, W. See citation (18).

(55) Schiefer, H. F., and Best, A. S.
1931. Carpet wear testing machine. U. S. Dept. Com., Bur. Standards, Jour. Research 6(6):927-936, illus.
A machine has been designed for wear testing of carpets. Tests are being made to determine if the results are a satisfactory measure of the probable relative durability of carpets in service.

(56) Schniewind, H. Z.
1930. Tissue abrasion tester. Instruments 3(9):596, illus.
Description of a machine designed by Schopper that combines both rotary and rolling motions.

(57) Schwarz, E. R.
1927. Machine for determining the resistance of fabrics to external abrasion. Textile World 72: [739], 741, 743, illus.
Emery cloth served as the abradant. Means of judging the progress of the abrasion in wear tests are discussed. Loss in tensile strength is considered a fair test.

(58) Smith, G. R.
See citation (86).

LUSTER

(59) Anonymous
1930. New device for analyzing transparent and opaque colors and gloss. Melliand 2:281-282.
The color analyzer developed by Razek and Mulder is described. A slight modification will adapt it to measure gloss.

(60) Ginsberg, I.
1925. Lustre and its determination. Textile Colorist. 47: 96-98, illus.
Describes three methods for measuring luster.

(61) Ingersoll, L. R.
1921. The glarimeter. Jour. Optical Soc. Amer. 5:213-217, illus.
The instrument measures gloss in terms of the fraction of the reflected light that is polarized.

(62) Klughardt, A.
1927. Ueber die Bestimmung des Glanzes mit dem Stufenphotometer. [The determination of luster with the Stufen photometer.] Ztschr. Tech. Phys. 8:109-119, illus.
A description and mathematical treatment of the method are given.

(63) Naumann, H.
1927. Glanzmessung an Geweben. [Luster measurements on fabrics.] Ztschr. Tech. Phys. 8:239-243, illus.
The author uses the apparatus described by Klughardt and shows a graphical method for measuring the variation in luster upon rotating the sample in its own plane.

(64) Schulz, H.
1924. Ueber Glanz und Glanzmessung. [Luster and luster measurements.] Melliand's Textilber. 5(1):25-27, illus.
This article discusses luster and several arrangements for measuring the luster of paper and fabrics.

STIFFNESS

(65) Appel, W. D.
1930. Flexometer for fabrics. Melliand 2(2):321.
A description is given of the apparatus designed at the Bureau of Standards to measure the energy of folding.

(66) Grimshaw, A. H.
1922. Measuring stiffness of sized cloth. Textile World 61: 2965, 2967, illus.
In the apparatus described, the strip of fabric is supported at one end and the amount it bends under its own weight, is measured.

(67) Oliver, D. A.
1931. Precision stiffness meter. Jour. Sci. Instruments 7: 318-322, illus. (Abstract in Sci. Abs. Sect. A, 34 (399):177.)
This gauge was designed to measure the stiffness of telephone diaphrams.

(68) Peirce, F. T.
1930. The "Handle" of cloth as a measurable quantity. Jour. Textile Inst. 21(9): T377-T416, illus.
The experimental method, a discussion of the various factors influencing stiffness, and the mathematical basis of the stiffness test are included.

(69) Peterson, E. C., and Dantzig, T.
1929. A quantitative method for measuring stiffness. U. S. Dept. Agr., Tech. Bul. 108, 29 p., illus.
Reports the experimental method. A derivation of the necessary formulae is given.

TENSILE STRENGTH

(70) Anonymous
1928. Tests strength of fabric. Textile World 74:3383.
A description is given of the ball burst attachment for the Scott tester.

(71) ________
1930. Bursting strength tester. Melliand 2(6):858-860, illus.
The "Schopper-Dalen" tester has a special instrument to measure the height of convexity before the sample breaks.

(72) ________
1930. Tear resistance. Standard specifications for tolerances and test methods for certain light and medium cotton fabrics. Amer. Soc. Testing Materials Proc. Pt. I: 1279-1280.
Two methods for determining tear resistance are described.

(73) ______
1930. Standard general methods of testing woven textile fabrics. Amer. Soc. Testing Materials Standards. Pt. II:1102-1106, illus.
The general methods for textile testing are given.

(74) ______
1930. Tearing tester. Melliand 2(7):985-986, illus.
The Elmendorf tester indicates in grams the resistance of fabricated materials to tearing.

(75) Barr, G.
1930. Effect of the dimensions of test-pieces on the results of the tensile test on textile fabrics. [Gt. Brit.] Dept. Sci. and Indus. Research. 2nd Rpt. Fabrics Co-ordinating Research Comm. 140-152, illus.
A study was made of the results of tensile strength determinations when samples of various lengths and widths were broken. Concludes that the dimensions of test pieces are arbitrary.

(76) Bercsi, J.
1925. Rejto method of testing cloths. Textile World 67: 2992-2993, illus.
Describes the machine and a special ruler for measuring diagrams drawn by the machine.

(77) Burkley, C. J.
1924. Useful test for fabric strength. Textile World 66: 483, 487, 493.
Discusses four strength tests; namely, breaking, bursting, tearing, and impact. The author believes the bursting strength is approximately proportional to the square root of the extensibility.

(78) Hamm, H. A., and Stevens, R. E.
1929. A method of measuring the stress-strain relations of wet textiles with application to wet rayons. U. S. Dept. Com., Bur. Standards, Jour. Research. 3(6): 927-936, illus.
An immersion tank was developed as auxiliary equipment for the recording stress-strain tester. The liquid is poured in after the sample has been placed in the jaws of the tester.

(79) Hathaway, R.
1929. Comparison of tensile strengths by bursting and grab methods. Melliand 1(3):375-378. (Abstract in Jour. Textile Inst. 20:A619.)
A mathematical analysis shows that the relation between the grab and bursting strength tests varies with the construction of the cloth.

(80) Lewis, W. S.
1916. Comparison of strip and grab methods of testing textile fabric for tensile strength. Amer. Soc. Testing Materials Proc. 16 Pt. I:366-369, illus.
From this study the author concludes that no general relation exists between the results obtained by the strip and grab methods.

(81) McGowan, F. R., and Hamlin, C. H.
1925. Method of testing knitted fabric. Textile World 67:3285, 3287, illus.
Recommends for breaking strength determinations of knitted fabrics, that samples be four inches wide, and the front jaws of the tester be one inch wide, and one inch apart.

(82) Moore, V. B.
1930. Two methods of calculating comparisons in tensile strength. Melliand 2(9):1176-1177.
A comparison is made of the bursting strength with the strength predicted from breaking strength tests.

(83) Pickard, R. H., and Wallace, W. M.
1919. Mechanical and physical tests for textile fabrics. Jour. Textile Inst. 10:240-244, illus.
The authors describe machines for making impact and repeated stress tests for determining the strength of fabrics.

(84) Schubert, F.
1930. Ueber eine neue Materialprüfart. [Concerning a new material test.] Kautschuk 6(10):207-210.
A modified tear test suitable for small samples is reported.

(85) Schwarz, E. R.
1931. Stretch in test specimens. Fibre and Fabric 84(2421): 19-22, illus.
Outlines a rapid method for measuring the stretch of a sample from the diagrams drawn by the autographic recorder when making breaking strength determinations.

(86) Smith, G. R.
1922. Testing strength of materials. 122 p., illus. London, E. Marlborough & Co.
Methods for testing yarns and fabrics are given. A wear testing machine with revolving blades is also described.

(87) Turner, A. J.
1920. Strength of fabrics. Jour. Textile Inst. 11:181-188, illus.
Describes tests to determine the tearing and impact strength of cloths. Also discusses the effects of rate of loading and dimensions of specimen on the results of strength tests.

(88) Walen, E. D.
1916. Comparison of strip and grab methods of testing textile fabrics for tensile strength. Amer. Soc. Testing Materials Proc. 16 Pt. I:370-376, illus.
The number of threads in the test piece were considered when comparing the strength as determined by the grab and strip methods.

(89) Whitcomb, H. H.
1928. Strength test for knitted fabrics. Textile World 73: 1701-1702, illus.
In this test the ball burst attachment replaced the jaws of the Scott tester for determining the bursting strength.

THERMAL PROPERTIES

(90) Anonymous
1928. The protective value of certain clothing fabrics. Kan. Agr. Expt. Sta. Bien. Rpt. 1926-1928:125-126.
The heat necessary to maintain an oil filled cylinder at constant temperature was determined when it was covered with different fabrics. The protective ratio is the ratio of the energy input for the unclothed cylinder to that of the energy input for the clothed cylinder.

(91) ________
1931. Apparatus for measuring thermal transmission of textiles. Jour. Franklin Inst. 211(3):378-379.
The apparatus developed at the Bureau of Standards is briefly described.

(92) Freedman, E.
1930. Thermal transmission of fabrics. Textile World 78(1): 58-59, 97, illus. and Amer. Soc. Testing Material 30, Part II:1025-1040.
Uses an electrical method to determine heat transmission of fabrics when exposed to air at controlled temperatures and wind velocities.

(93) Gregory, J.
1926. An experimental method for investigating the thermal properties of cotton fabrics. Jour. Textile Inst. 17:T553-T566, illus.
Some experimental methods are described for studying and comparing the thermal properties of fabrics.

(94) ________
1930. The absorption, transmission and reflection of radiant heat by fabrics. Jour. Textile Inst. 21(2):T57-T65, illus.
Reports the experimental method. Various types of fabrics were studied in relation to the protection they offer.

(95) Haven, G. B.
1917. Testing blankets for heat transmission. Textile World Jour. 52: [3307]-3309, illus.
In the experimental procedure as outlined for measuring heat transmission, the sample under test was wound on a pipe maintained at blood temperature.

(96) ______
1918. Modern methods of testing blankets for heat transmission. U. S. Dept. Com., Bur. Standards, Misc. Pub. 19:33-40, illus.
The ends of the heated pipe described in citation (95) were insulated. An instrument for measuring the thickness is also given.

(97) Hess, K.
1931. A comparative study of the protective value of certain fabrics in still and moving air. Melliand 2(12):1533-1536, illus.
See citation (98). The ratings for seven fabrics are included.

(98) ____, Floyd, E. V., and Baker, L.
1930. A comparative study of the protective value of certain fabrics in still and moving air. Jour. Agr. Research [U. S.] 41(2):139-146, illus.
Describes the calorimeter and wind tunnel used in determining the heat transmission of fabrics in still and moving air. A curve was plotted for the thickness at different loads and was extrapolated to zero loading to obtain the thickness of the fabric.

(99) Leusden, F. P.
1929. Zur Bestimmung des Wärmehaltungsvermögens von Bekleidungsstoffen. [On the determination of the heat retension of clothing materials.] Ztschr. Hyg. u. Infektionskrank. 109:616-618. (Abstract in Bul. Hyg. 4:954.)
Using the katathermometer, the author shows that the heat protecting effect is dependent on the hygroscopic moisture of the fabric.

(100) Marsh, M. C.
1930. Thermal insulating properties of fabrics. Proc. Phys. Soc. [London] 42 Part 5(235):570-588 and Jour. Textile Inst. 22(5):T245-T273, illus. 1931.
An electrical method is used to determine the heat insulation of fabrics.

(101) McGowan, F. R., and Sale, P. D.
1923. Heat retaining properties of fabrics. Textile World 63: 2607-2609; 3041-3043.
Discussion of the work at the U. S. Bureau of Standards on blanket materials. The apparatus described in citation (107) has been modified in order to test the samples in a breeze.

(102) Miller, L. F.
1927. Relation of heat transmission to humidity in insulating materials. Phys. Rev. (2) 29:370-371. (Abstract in Jour. Textile Inst. 18:A212.)
The results indicate that heat transmission of textile fibers increases linearly as the moisture content increases. The hot and cold plate apparatus used has a guard ring.

(103) Müller, A.
1926. Die Anwendung des "Davoser Frigorimeters" zur Bestimmung des Wärmehaltungsvermögens von Kleiderstoffen. [Application of the "Davos frigorimeter" to the study of the thermal properties of clothing materials.] Arb. Reichsgsndhtsamt [Germany] 57: [314] -317.
Fabrics used for men's and women's stockings were examined by using the Davos frigorimeter in both still and moving air at temperatures around 8° C. A description of the apparatus is included.

(104) Priestman, H.
1921-1922. Heat-retaining properties of woolen and worsted cloths. Jour. Leeds Univ. Textile Assoc. 7:35-39. (Reprinted in Textile World 62:1426-1429. Abstract in Jour. Textile Inst. 12:324. Original not seen.)
The rate of cooling of cylinders covered with fabrics was determined. Experiments were conducted in still air and in air currents from an electric blower.

(105) Rood, E. S.
1921. Thermal conductivity of some wearing materials. Phys. Rev. (2) 18:356-361.
The author measured the conductivity of knitted and woven cotton, wool, linen, and silk materials, using the disc method of Lees.

(106) Sale, P. D.
1924. Specifications for constructing and operating heat-transmission apparatus for testing heat-insulating value of fabrics. U. S. Dept. Com., Bur. Standards, Technol. Paper 269:595-607, illus.
Supplement to paper 266. See citation (107). Instructions are given for constructing the heat transmission apparatus.

(107) ________, and Hedrick, A. F.
1924. Measurement of the heat insulation and related properties of blankets. U. S. Dept. Com., Bur. Standards, Technol. Paper 266:529-546, illus.
The experimental methods are described for determining the heat transmission, air permeability, and permeability to water vapor of fabrics.

(108) Spafford, A. L.
1927. Improved apparatus for measuring thermal conductivity. Ice and Refrig. 72:176-177, illus.
A hot plate method was used to determine the heat transmission of insulating materials. To measure the thickness of compressible materials, the thickness of glass plates was measured with a micrometer, alone and with the test sample between.

(109) Speakman, J. B., and Chamberlain, N. H.
1930. Thermal conductivity of textile materials and fabrics. Jour. Textile Inst. 21:T29-T56, illus.
The conductivity of fabrics held between metal plates was determined with an apparatus designed on the principle of the Bunsen ice calorimeter. Fabrics of different weaves and finishes were studied.

(110) Staff, H.
1925. The effect of humidity on the thermal conductivity of wool and cotton. Phys. Rev. (2) 25:252. (Abstract of paper presented at the meeting of the Amer. Phys. Soc. held December 29-30, 1924, in Washington, D. C.)
Lees' disc method is used for determining the thermal conductivity of fabrics. Layers of material of any moisture content desired are placed between a central, electrically heated disc and two outer copper discs which are water cooled. Some experimental values are reported.

(111) Techoueyres, E., and Walbaum, M.
1927. Note au sujet des qualites d'isolement thermique, de perméabilité et d'affinité pour l'eau présentées par les diverses sortes d'etoffes utilisées comme sous-vêtements. [Note on the heat insulation, permeability, and affinity for water offered by different materials used for garments.] Bul. Acad. Méd. [Paris] (3) 98: 107-109. (Abstract in Bul. Hyg. 3(11):991. 1928.)
The experimental methods are described. The conclusion drawn from this work is that woolen cloths of the flannel type are best suited for underwear.

(112) Vintschger, J.
1929. Das Wärme-isolieurungsvermögens der Kleidungsstoffe, gemessen mit Hilfe des Davoser Frigorimeters. [The heat insulation of clothing materials measured with the Davos frigorimeter.] Arch. Hyg. u. Bakt. 101 (5): [261]-289, illus.
The protection offered by fabrics in still and moving air was studied by means of the frigorimeter and the katathermometer. Experimental values and a description of the apparatus are given.

THICKNESS

(113) Anonymous.
1928. Proposed report of D-13, Sub-Committee II on Fabric Test Methods. Amer. Soc. Testing Materials on the measurement of the thickness of pile and napped fabrics. 3 p., mimeo., 5 blueprints.
This report compares the measurements made by nine laboratories on five representative fabrics.

(114) ________
1928. Minutes of the meeting of D-13, Sub-Committee II on Fabric Test Methods. Amer. Soc. Testing Materials. Held in Washington, D. C., Oct. 10th. 2 p., mimeo.
A method is proposed for determining the thickness of napped and pile fabrics.

(115) Cartland, F. W.
1928. Practical method and new gage developed for measuring quantity of nap on canton flannel. Textile World 74 (4):425-426, 431, illus.
The gage and experimental method are described.

(116) Emley, W. E.
1931. Measurement of thickness of textiles and similar materials. Proc. Amer. Soc. Testing Materials 31 (Part I):608-611.
Discusses methods for determining the thickness of textiles. Specifications and tolerances are given for a gage proposed as a standard.

(117) Haven, G.
1931. Future textile-laboratory practice. Textile World 79 (1):42-44, illus.
Proposes a modification of the thickness gauge in general use, to insure a uniform rate of dropping the pressor foot.

(118) ________
See citation (96).

(119) Hays, M. B.
1931. A method for determining the thickness of pile and napped fabrics. Jour. Home Econ. 23:560-564, illus.
In the method described, the cross-sectional area of a sample is measured optically.

(120) Hess, K., Floyd, E. V., and Baker, L.
See citation (98).

(121) Marsh, M. C.
1929. An instrument for the measurement of the thickness of compressible solids. Jour. Sci. Instruments 6(12): 382-384.
The thickness gauge is equipped with an electrical attachment to indicate when contact is made.

(122) Peirce, F. T.
See citation (68)

(123) Rubner, M.
1896. Sphärometer mit variirbarer Belastung. [Spharometer with variable load.] Arch. Hyg. 27:44-48, illus.
Description of the instrument used by continental investigators to determine the thickness of compressible materials.

(124) Schofield, J.
1930. Porosity; a primary property in textiles. Jour. Soc. Dyers and Colourists 46(11):368-375, illus. (Abstract in Jour. Textile Inst. 22:A202-A203. 1931.)
Part II describes an instrument that measures the mean thickness over an area of 16 square inches.

(125) Spafford, A. L.
See citation (108)

ULTRA-VIOLET TRANSMISSION.

(126) Alexander, F. W.
1926. Textile fabrics: ultra-violet transmission. (Abstract) Jour. Textile Inst. 17:A239; Simple portable photometer for gauging intensity of ultra-violet rays. (Abstract) Analyst 51:54.
The experimental method for determining ultra-violet transmission is described. The order in which the fabrics transmit the near ultra-violet is reported.

(127) Barrett, T.
1924. Measurement of the transparency of a fabric. Faraday Soc. Trans. 20 (Pt. 2):236-239, illus.
The method for measuring transparency is described and the values for four fabrics are reported.

(128) Coblentz, W. W., Stair, R., and Schoffstall, C. W.
1928. Some measurements of the transmission of ultra-violet radiation through various kinds of fabrics. U. S. Dept. Com., Bur. Standards, Jour. Research 1(2):105-124, illus.
Various kinds of cotton, natural silk, rayon, linen, and wool fabrics were studied. The amount of radiation transmitted directly through the yarns was measured.

(129) Hess, K., Hamilton, J. O., and Justin, M.
1927. Protection afforded the skin against sunburn by textile fibers. Jour. Agr. Research [U. S.] 35:251-259, illus.
The ratio of the time required to burn the skin when it is protected by certain fabrics and when it is unprotected was determined experimentally. Sunlight and ultra-violet lamps were used.

(130) Hirst, H. R., King, P. E., and Lambert, P. N.
1928. Transmission of ultra-violet radiation by various fabrics. Jour. Soc. Dyers and Colourists 44:109-113, illus.
In this study the thickness of fabric necessary to cut off the ultra-violet rays was taken as a measure of the transparency. It shows that weave and texture are the chief factors controlling the transmission of light rays.

(131) Weltzien, W.
1930. Ultra-violet radiation in textile research. Amer. Dyestuff Rptr. 19:825, (from Seide 35:195.)
The radiation from two mercury vapor lamps and a carbon arc was studied. The mercury lamp is low in intensity but has a purer ultra-violet radiation, that is, freer from red radiation.

WATER ABSORPTION

(132) Gregory, J.
1930. Transfer of moisture through fabrics. Jour. Textile Inst. 21(2):T66-T84, illus.
Experimental methods are given for studying the rate and the mechanism of transfer of moisture through fabrics.

(133) Hamm, H. A., and Jessup, D. A.
1929. A comparison of methods for determination of moisture in textiles. Amer. Dyestuff Rptr. 18: [637]-639.
The variations in moisture content were studied for samples which were dried in two types of conditioning ovens, by toluene distillation, and in a dessicator with sulphuric acid.

(134) Lehmann, K. B.
1906. Ueber die Ursachen des verschiedenen kapillaren Wasseraufsaugevermögens dichter weisser Leinen und Baumwollstoffe. [Concerning the causes of the different capacity for capillary water absorption of closely woven white linen and cotton materials.] Arch. Hyg. 59:266-282.
In order to study the effect of temperature, humidity, sizing, bleaching, and fabric structure on water absorption, observations were made of the rate a liquid ascends in fabrics.

(135) Sale, P. D., and Hedrick, A. F.
See citation (107)

(136) Shorter, S. A.
1923. Moisture content of wool - its relation to scientific theory and commercial practice. Jour. Soc. Dyers and Colourists 39:270-276, illus.
A discussion of regain and the method for determining it.

(137) Stevenson, L., and Lindsay, M.
1926. Methods of testing the absorption of water by cotton toweling. Jour. Home Econ. 18:193-198.
Five methods of testing for water absorption are described. Four methods give the same rating of the fabrics.

WATERPROOFNESS

(138) Anonymous
1929. Report of the sub-committee on waterproof standards. Amer. Dyestuff Rptr. 18:523-525. (Abstract in Chem. Abs. 23(19):4826.)
Includes a brief description of a hygrostatic pressure apparatus used by the American Association of Textile Chemists and Colorists for measuring resistance of fabrics to water.

(139) ________
1930. Imperméabilisation des tissus de coton et de lin. [Impermeability of cotton and linen fabrics.] Tiba 8 (2):147-155.
A resume is given of methods of testing for waterproofness.

(140) Appel, W. D.
1931. The critical chemist and colorist. Amer. Dyestuff Rptr, Sample Swatch Quarterly. Jan. 19, p. 52-55.
The various methods for testing waterproofness are discussed and a box method is proposed.

(141) Barr, G.
1930. Determination of waterproofness of porous waterproof fabrics. [Gr. Brit.] Dept. Sci. Ind. Research 2nd Rpt. of the Fabrics Coordinating Research Comm. 113-139. (Abstract in Chem. Abs. 24:3375.)
An experimental method is reported. The apparatus uses hygrostatic pressure which is increased at a constant rate.

(142) Burr, A. H.
1928. A simple constant drop apparatus. Jour. Soc. Dyers and Colourists 44:18-19, illus. (Abstract in Jour. Textile Inst. 19:A139.)
The drop test for measuring waterproofness of fabrics is described.

(143) Gawalowski, A.
1893. Apparat und Methode zur Prüfung wasserdicht imprägnirter Gewebe auf ihre Leistungsfähigkeit. [Apparatus and methods for testing waterproofed fabrics for serviceability.] Leipziger Monatschr. Textil-Indus. 8:221-222, illus.
The sample to be tested is placed at the bottom of a tube containing water a foot deep and the amount of water passing through in twenty-four hours is observed.

(144) Hays, M. B.
1930. Methods of testing waterproofed fabrics. Jour. Home Econ. 22:675-679, illus.
A simple apparatus employing hydrostatic pressure is described. The sample is required to withstand a certain pressure for one hour.

(145) Jarrell, T. D., and Holman, H. P.
1928. Effectiveness of materials used for waterproofing canvas, and their influence on the fabric. Textile World 73: [3103]-3105.
A system is given for rating the fabrics when using the funnel test.

(146) LeRoy, G. A.
1915. Sur la mesure de l'imperméabilisation des draps et tissus militaires. [Measuring the impermeability of cloth and military fabric.] Compt. Rend. Acad. Sci. [Paris] 160:803-805, illus.
Describes an apparatus for measuring the permeability of fabrics to water under comparable conditions of pressure, time, and temperature.

(147) Martin, G., and Wood, J.
1919. Notes on the quantitative testing of rainproof and waterproof cloth. Jour. Soc. Chem. Indus. 38:T84-T87, illus. (Abstract in Chem. Abs. 13:1932-1933.)
The various experimental methods are discussed. The drop test is the most efficient in the opinion of the authors.

(148) Veitch, F. P., and Jarrell, T. D.
1920. Determination of the water resistance of fabrics. Jour. Indus. and Engin. Chem. 12:26-30, illus. Also Textile World Jour. 57:2811-2813.
Modifications of the funnel and spray tests are reported.

(149) Williams, H. M.
1928. Limitations of the "drop" test. Wool Record and Textile World 33:1299-1301. (Abstract in Jour. Textile Inst. 19:A297. 1928.)
The author considers that the drop test is an inadequate test for cloths of homespun character.

(150) Wosnessensky, N. N.
1915. A new instrument for measuring the degree of impermeability of cloth. Jour. Soc. Dyers and Colourists 31:50, illus.
The sample is put over a box and subjected to an increasing hydrostatic pressure. The amount which it will withstand is a measure of the impermeability of the cloth.

(151) ________
1923. The penetrometer and its importance in determining the water resistance of fabrics. Reports of the All-Russian Textile Industry p. 11, 19. (Translated in Amer. Dyestuff Reporter 13:781-783, 794. 1924. Original not seen.)
Advocates an instrument using hydrostatic pressure for testing the water resistance of fabrics.

YARN COUNT

(152) "Tester"
1931. Testing of yarns for count. Wool Record & Textile World 39(1131):163, 165, 167.
A yarn extension testing machine designed by Prof. Barker is described and the change in yarn count upon finishing a cloth is discussed.

(153) Woodhouse, T.
1921. Yarn counts and calculations. London, Henry Frowde and Hodder & Stoughton. 119 p., illus.
Definitions, yarn counts, and tables for converting from one system to another are given. Yarn twist and angle of twist are also discussed.